

# NASA TECH BRIEF

## Marshall Space Flight Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

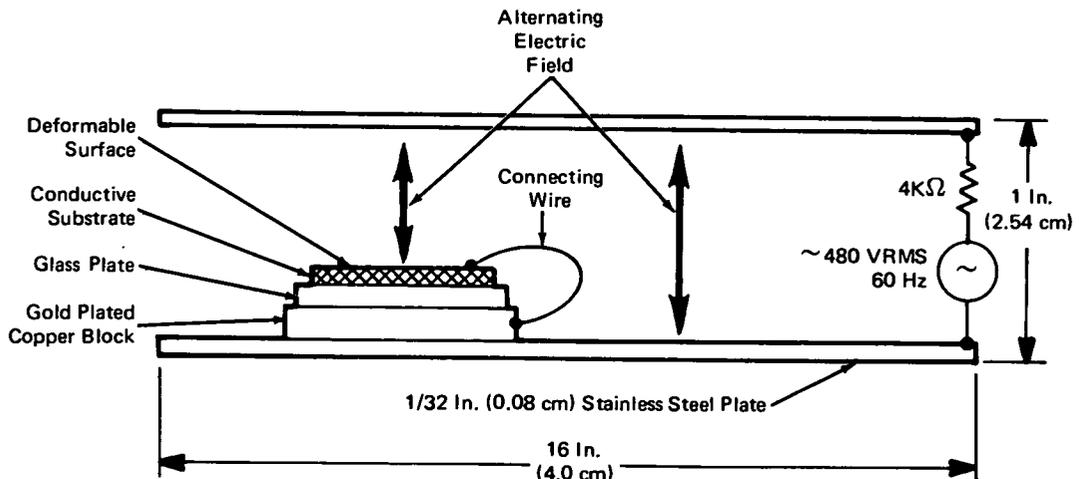
### Photoemissive Coating

A method has been developed of applying a photoemissive coating to photoemissive holographic storage tubes through the application of a polystyrene coating to the substrate via glow discharge polymerization in an inert environment. The complex styrene coatings exhibit an amorphous structure of approximately 50 Å polycrystallite, possess a glass transition temperature of about 146°C, and have a melting temperature of approximately 205°C. The coatings have a dielectric constant of approximately 6 and vapor pressures of approximately  $10^{-11}$  torr at 90°C and  $5 \times 10^{-10}$  at 150°C. The styrene monomer, with an additive for stability, is introduced into a vacuum system in an amount such that 100 percent evaporation yields a pressure within the system of approximately 0.15 torr (150 microns). The pressure is then increased to 0.5 torr (500 microns) by bleeding argon into the system.

The deformable surfaces upon which the styrene coatings are to be deposited are placed between two parallel circular stainless steel plates. The energy necessary to polymerize and crosslink the styrene monomer is supplied by an alternating electric field. To ensure

adequate ionization and surface retention times, it is necessary to make electrical contact between the conductive substrate on which the deformable surface rests and one of the two circular plates to which the voltage source is connected. The arrangement, as illustrated, is satisfactory both for routine throughput complex styrene coatings and reasonably uniform electrical field distributions between the conductive substrate and the circular plate. A TIC film on a glass plate constitutes the conductive substrate. This structure is placed upon a gold-plated copper block with a wire connecting the substrate and the copper block, which rests upon the lower plate. A pressure contact is used to connect the wire to the TIC film, and the opposite end of the wire is soldered to the gold plated copper block.

The styrene coating is believed to grow in a macromolecular fashion with the entire coating being one large molecule. After deposition of the styrene coating onto the deformable surface, the entire structure is placed into a second vacuum system and the system pumped down to a pressure of approximately  $10^{-7}$  torr. Antimony is added



(continued overleaf)

to the system and evaporated at 140°C to the desired thickness. Then cesium is added until a peak in photoemissive current is observed. At this point, cesium is discontinued, and the 140°C temperature is sustained until the observed photoemission is a maximum value. The photoemissive cesium-antimony layer has been observed not to react with the complex styrene coating over long periods, and the surface appears to be quite stable.

**Notes:**

1. In addition to the obvious application of the technique for polymeric coating, information concerning this innovation may be useful in the preparation of perfectly organized polymeric films that could be utilized as single-crystal membranes. These membranes would be capable of high selectivity filtration and/or separation.
2. Requests for further information may be directed to:  
Technology Utilization Officer  
Marshall Space Flight Center  
Code A&PS-TU  
Marshall Space Flight Center, Alabama 35812  
Reference: B72-10638

**Patent status:**

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel  
Marshall Space Flight Center  
Code A&PS-PAT  
Marshall Space Flight Center, Alabama 35812

Source: R. A. Gange of  
RCA Corporation  
under contract to  
Marshall Space Flight Center  
(MFS-22003)